

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C. 20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 05 April 2000 (05.04.00)	
International application No. PCT/EP99/05023	Applicant's or agent's file reference PC761
International filing date (day/month/year) 16 July 1999 (16.07.99)	Priority date (day/month/year) 20 July 1998 (20.07.98)
Applicant ZACCONE, Ernesto et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

17 February 2000 (17.02.00)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer C. Cupello Telephone No.: (41-22) 338.83.38
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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference PC761	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP99/05023	International filing date (day/month/year) 16/07/1999	Priority date (day/month/year) 20/07/1998
International Patent Classification (IPC) or national classification and IPC H01B9/00		
Applicant PIRELLI CAVI E SISTEMI S.P.A. et al.		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 9 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 3 sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none">I <input checked="" type="checkbox"/> Basis of the reportII <input type="checkbox"/> PriorityIII <input checked="" type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicabilityIV <input checked="" type="checkbox"/> Lack of unity of inventionV <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statementVI <input type="checkbox"/> Certain documents citedVII <input checked="" type="checkbox"/> Certain defects in the international applicationVIII <input checked="" type="checkbox"/> Certain observations on the international application		
Date of submission of the demand 17/02/2000	Date of completion of this report 21.09.2000	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Lohberger, S Telephone No. +49 89 2399 6723	



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP99/05023

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-14 as originally filed

Claims, No.:

1-29 as received on 30/08/2000 with letter of 30/08/2000

Drawings, sheets:

1/6-6/6 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application.
- ☒ claims Nos. 21-27.

because:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP99/05023

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

- ☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

- ☒ no international search report has been established for the said claims Nos. 21-27.

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
- ☐ paid additional fees.
- ☐ paid additional fees under protest.
- ☒ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.
- ☒ not complied with for the following reasons:

see separate sheet

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☒ all parts.
- ☐ the parts relating to claims Nos. .

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP99/05023

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	3,4-7, 12, 15, 16, 28, 29
	No:	Claims	1, 2, 8-11, 13, 14, 17-20
Inventive step (IS)	Yes:	Claims	3, 28, 29
	No:	Claims	1, 2, 4-20
Industrial applicability (IA)	Yes:	Claims	1-29
	No:	Claims	

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item IV

Lack of unity of invention

1. Claim 19 seems to be a copy of an embodiment of D1 and does not show the feature of a tubular structure as this is afforded by claim 1 and the single general inventive concept (a grooved core is no tubular structure).
2. Claims 21 to 27 relate to an optical fibre element, whereas present claim 1 relates to a hybrid electrical-optical cable with specific supporting rope for solving compression problems in overhead installation. Claims relating to optical fibres alone do not show this inventive concept.
3. Present claim 29 does not show the same general inventive concept than claim 1, in that the feature of a supporting rope with the tubular element containing the optical element is missing. The expression "suitable for" does not express that the optical element must be contained in the tubular element.

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following document/s:

D1: FR-A-2 563 042 (ELECTRICITE DE FRANCE) 18 October 1985 (1985-10-18)
D2: DE 32 24 597 A (SIEMENS AG) 29 December 1983 (1983-12-29)
D3: US-A-5 687 271 (RABINOWITZ MARIO) 11 November 1997 (1997-11-11)
D4: GB-A-2 035 599 (ASS ELECT IND) 18 June 1980 (1980-06-18)
D5: PATENT ABSTRACTS OF JAPAN vol. 1997, no. 09, 30 September 1997 (1997-09-30) & JP 09 115352 A (HITACHI CABLE LTD), 2 May 1997 (1997-05-02)
2. D1, especially description page 1, line 1 to page 4, line 1, claims and figures discloses a hybrid electrical-optical cable as presented in present claim 1. Three

insulated phase conductors are placed around a supporting rope. The supporting rope comprises optical fibre elements, a tubular structure made of rigid thermoplastic material (page 3, lines 23 to 26) and an externally placed supporting structure made of steel wires. In present Application the tubular structure as well is made of thermoplastic material. So the structure of D1 must be considered to be resistant to transverse compression. Consequently all relevant features of claim 1 are known from D1.

Therefore claim 1 is not in accordance with article 33(2) PCT with regard to D1.

In this context it should be remarked that the expression "helically wound around" in present claim 1 does not exclude the case of a central supporting rope as this discloses D1.

Applicant's argumentation with regard to the Al sheath is convincing. Therefore metal tubes as tubular structures resisting to transverse compression are not addressed in D1.

3. Applicant's argumentation with regard to D2 cannot be accepted, since claim 1 does not specify any values for the "high" mechanical modulus. Therefore the layer 6 of D2, fig.1 is considered to have such a not further specified "high" mechanical modulus as well.

Consequently D2, especially description page 5, line 8 to page 7, line 10, figures and claims still discloses a hybrid electrical-optical cable as presented in present claim 1. Three insulated phase conductors are wound helically around a supporting rope. The supporting rope comprises optical fibre elements, a tubular structure made of plastics (6) and an externally placed supporting structure made of steel wires (10). In present Application the tubular structure as well can be made from plastics (see claims 8 or 9). So the structure of D2 as well must be considered to be resistant to transverse compression. Consequently all relevant features of claim 1 are known from D2 as well.

Therefore claim 1 is not in accordance with article 33(2) PCT with regard to D2.

It does not matter whether D2 relates to a high-voltage cable or not, since claim 1 is not restricted to low or medium voltage cables, which might have different technical problems to solve than high voltage cables.

4. The subject-matter of claims 8 or 9 is not suitable to lead in combination with claim 1 to an acceptable main claim, since the features given there are so broad, that they do not seem to make sense over their whole claimed range. E.g. a ratio of 100 is allowed but certainly would lead to difficulties during extraction of the supporting rope. Besides this the indicated ratios of claims 8 to 10 are already known from D1, Fig. 1.

The subject-matter of claims 11, 13, 14, 17 and 18 is already known from D2. The subject-matter of present claims 2 and 19 is already known from D1. Consequently these claims are not suitable either to lead in combination with claim 1 to an acceptable main claim.

Besides this it should be mentioned that claim 19 seems to be a copy of an embodiment of D1 and does not show the feature of a tubular structure as this is afforded by claim 1 and the single general inventive concept.

5. The subject-matter of claims 3 to 7 is considered to be novel over the cited prior art, since D1 does neither disclose a metal tube against transverse compression nor the specific plastic materials mentioned in claim 4 to 7.
6. Claim 3 can be considered to be based on an inventive step as well, since D1 only proposes a normally thin Al sheath for the purpose of water protection and not for transverse compression protection. So it was not evident starting from D1 and increasing the thickness of the Al sheath in order to get a transverse compression protection too.
7. The subject-matter of claims 4 to 7 is not in accordance with article 33(3) PCT, since D1 already discloses a rigid plastic tubular element for transverse compression protection and the Applicant did not file any arguments why the specific materials of claims 4 to 7 would show any surprising advantages over the materials of D1.
8. A pitch a taught in claim 12 seems to be rather normal in the field of electrical-optical cables and cannot lead to any surprising advantages over known cables. Similarly the material of the metal wires as set out in claims 15 and 16 do not seem to go beyond the knowledge of the skilled artisan. With respect to claims 18

and 20 it must be remarked that the immersing of optical fibres in a filler is known from D2, page 5, lines 29 to 32.

9. Present claim 28 is novel over the cited prior art. The presence of an inventive step under article 33(3) PCT is accepted, since neither D1 nor D2 suggest the fixing of the cable to sustaining structures by mooring means via the supporting rope.
10. Present claim 29 does not show the same general inventive concept than claim 1, in that the feature of a tubular element containing the optical element is missing. (Hereto please see section IV)
A claim 29 with an optical element within the tubular element would have been acceptable under article 33 PCT.
11. D3 to D5 are not considered to be of relevance for present Application. D3 does not disclose an overhead line with supporting rope, D4 and D5 do not show the feature of externally placed supporting structures.

Re Item VII

Certain defects in the international application

1. The amendments filed with the letter dated 30.08.2000 introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 34(2)(b) PCT. The amendments concerned are the following: claim 21 "...optical fibre coated by at least a containing layer".

Re Item VIII

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP99/05023

Certain observations on the international application

1. The passage on present page 3, lines 30 to 33 is not quite correct with regard to the citation of D1. See D1 page 3, lines 23 to 32 (article 6 PCT).

CLAIMS

1. Hybrid electrical-optical cable for overhead installations, comprising three insulated phase conductors helically wound around a supporting rope, wherein said supporting rope comprises:
 - at least one optical fibre element;
 - a tubular structure containing said at least one optical fibre element, said tubular structure being made from a material having a high mechanical modulus to resist to transverse compression;
 - a supporting structure resistant to longitudinal tension placed externally to said tubular structure.
2. Cable according to claim 1, wherein the material of said tubular structure is selected from the group comprising: metals, metal alloys, high-modulus polymers.
3. Cable according to claim 2, wherein said tubular structure is made from aluminium or stainless steel.
4. Cable according to claim 2, wherein said high-modulus polymers comprise polypropylene, modified polypropylene, polybutylene terephthalate, polyether imides and polyether sulphones.
5. Cable according to claim 1, wherein said tubular structure is made from an expanded polymer.
6. Cable according to claim 5, wherein said expanded polymer is selected from olefin polymers or copolymers.
7. Cable according to claim 6, wherein said expanded polymer comprises polypropylene.
8. Cable according to anyone of the preceding claims, wherein the ratio between the diameter of said supporting rope and the diameter of each insulated conductor is predetermined so as to make said rope extractable from said helically wound insulated conductors.
9. Cable according to claim 8, wherein said ratio is greater than 0.3.
10. Cable according to claim 9, wherein said ratio is from 0.4 to 1.5.
11. Cable according to anyone of the preceding claims, wherein the insulated conductors are wound around said supporting rope with a predetermined pitch so as to make the cable self-sustaining.
12. Cable according to claim 11, wherein said pitch is from 10 to 50 times the diameter of each insulated conductor.
13. Cable according to anyone of the preceding claims, wherein the supporting structure comprises an armour comprising one or more layers of metal wires

- helically stranded around said tubular structure.
14. Cable according to claim 13, wherein said metal wires are made from steel.
 15. Cable according to claim 14, wherein said metal wires are made from aluminium-coated or zinc-plated steel.
 16. Cable according to claim 13, wherein said metal wires are made from an aluminium alloy.
 17. Cable according to anyone of the preceding claims, wherein said supporting structure is coated by an electrically insulating layer.
 18. Cable according to anyone of the preceding claims, wherein said optical fibre element comprises a central reinforcing element around which one or more tubular elements, containing one or more optical fibres immersed in a buffering filler, are disposed.
 19. Cable according to anyone of claims 1 to 17, wherein said optical fibre element comprises a central reinforcing element around which is disposed a grooved core in which are formed externally one or more grooves which extend longitudinally along the outer surface of said core, said grooves being filled with a buffering filler in which one or more optical fibres are housed.
 20. Cable according to any one of claims 1 to 17, wherein said optical fibre element comprises a tubular element containing one or more optical fibres immersed in a buffering filler.
 21. Optical fibre element comprising at least one optical fibre coated by at least a containing layer, said optical fibre element being fitted in a tubular structure made from an expanded polymeric material.
 22. Optical fibre element according to claim 21, characterized in that said polymeric material is selected from olefin polymers or copolymers.
 23. Optical fibre element according to claim 22, characterized in that said polymeric material comprises polypropylene.
 24. Optical fibre element according to anyone of the claims from 21 to 23, characterized in that said polymeric material has a degree of expansion from 20% to 3000%.
 25. Optical fibre element according to claim 24, characterized in that said polymeric material has a degree of expansion from 30% to 500%.
 26. Optical fibre element according to anyone of the claims from 21 to 25, wherein before expansion said polymeric material has a flexural modulus at room temperature between 200 and 2000 MPa.
 27. Optical fibre element according to claim 26, wherein said flexural modulus is between 400 and 2000 MPa.
 28. Overhead system for electrical power distribution and for telecommunications,

comprising a cable comprising three insulated phase conductors wound around a supporting rope, said cable being fixed between sustaining structures by mooring means operating on said supporting rope, characterized in that said supporting rope comprises at least one optical fibre element fitted in a tubular structure resisting to transverse compression.

29. Method for suspending a hybrid electrical-optical cable to an overhead line, said cable comprising:

- three insulated phase conductors helically wound around a supporting rope,
- a tubular structure made of a high mechanical modulus material suitable for containing at least one optical element, and
- a supporting structure placed externally to said tubular structure,

wherein said method comprises:

- pushing at least one of the three insulated conductors so as to make the supporting rope accessible from the outside;
- hooking the supporting rope by a hooking means;
- extracting the supporting rope by the hooking means from the wound insulated conductors for a predetermined length;
- clamping the extracted length of the supporting rope by a mooring means;
- releasing the supporting rope from the hooking means;
- suspending the cable to sustaining structures of the overhead line by the mooring means.

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference PC761	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/EP 99/ 05023	International filing date (day/month/year) 16/07/1999	(Earliest) Priority Date (day/month/year) 20/07/1998
Applicant PIRELLI CAVI E SISTEMI S.P.A. et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,



the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,



the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.



as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.

1



None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 99/05023

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>PATENT ABSTRACTS OF JAPAN vol. 1997, no. 09, 30 September 1997 (1997-09-30) & JP 09 115352 A (HITACHI CABLE LTD), 2 May 1997 (1997-05-02) abstract -----</p>	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 99/05023

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
FR 2563042	A	18-10-1985	NONE	
DE 3224597	A	29-12-1983	NONE	
US 5687271	A	11-11-1997	NONE	
GB 2035599	A	18-06-1980	NONE	
JP 09115352	A	02-05-1997	NONE	

CLAIMS

1. Hybrid electrical-optical cable for overhead installations, comprising three insulated phase
5 conductors helically wound around a supporting rope, wherein said supporting rope comprises:
at least one optical fibre element;
a tubular structure containing said at least one
optical element, said tubular structure being resistant
10 to transverse compression;
a supporting structure resistant to longitudinal
tension placed externally to said tubular structure.
2. Cable according to claim 1, wherein the ratio
15 between the diameter of the supporting rope and the
diameter of each insulated conductor is predetermined
so as to make the rope extractable from the helically
wound insulated conductors.
- 20 3. Cable according to claim 2, wherein the ratio
between the diameter of each insulated conductor and
the diameter of the supporting rope is greater than
0.3.
- 25 4. Cable according to anyone of the preceding
claims, wherein the insulated conductors are wound
around the supporting rope with a predetermined pitch
so as to make the cable self-sustaining.
- 30 5. Cable according to claim 4, wherein the
insulated conductors are wound around the supporting
rope with a pitch of from 10 to 50 times the diameter
of each insulated conductor.
- 35 6. Cable according to anyone of the preceding
claims, wherein the tubular structure is constituted by

a material having a high mechanical modulus.

7. Cable according to claim 6, wherein the tubular structure is made from a metal or metal alloy
5 with high corrosion resistance.

8. Cable according to claim 6, wherein the tubular structure is made from a polymeric material.

10 9. Cable according to claim 6, wherein the tubular structure is made from an expanded polymeric material.

10. Cable according to anyone of the preceding
15 claims, wherein the supporting structure comprises an armour comprising one or more layers of metal wires helically stranded around the tubular structure.

11. Cable according to claim 10, wherein the
20 metal wires are made from steel.

12. Cable according to claim 10, wherein the metal wires are made from aluminium-coated or zinc-plated steel.
25

13. Cable according to claim 10, wherein the metal wires are made from an aluminium alloy.

14. Cable according to anyone of the preceding
30 claims, wherein the supporting structure is coated by an electrically insulating layer.

15. Cable according to anyone of the preceding
35 claims, wherein the optical fibre element comprises a central reinforcing element, around said reinforcing element being disposed one or more tubular elements

containing one or more optical fibres immersed in a buffering filler.

16. Cable according to anyone of claims 1 to 14,
5 wherein the optical fibre element comprises a central reinforcing element around which is disposed a grooved core in which are formed externally one or more grooves which extend longitudinally along the outer surface of the said core, the said grooves being filled with a
10 buffering filler in which one or more optical fibres are housed.

17. Cable according to any one of claims 1 to 14,
15 wherein the optical fibre element comprises a tubular element containing one or more optical fibres immersed in a buffering filler.

18. Overhead system for electrical power distribution and for telecommunications, comprising a
20 cable comprising three insulated phase conductors wound around a supporting rope, the said cable being fixed between sustaining structures by mooring means, characterized in that the said supporting rope includes at least one optical fibre element.

25 19. Overhead system according to claim 18, wherein the said supporting rope comprises at least one optical fibre element fitted in a tubular structure which resists transverse compression, a supporting
30 structure resistant to longitudinal tension being present around the said tubular structure.

20. Method for suspending a hybrid electrical-optical cable to an overhead line, said cable
35 comprising three insulated phase conductors helically wound around a supporting rope, wherein said method

comprises:

- pushing at least one of the three insulated conductors so as to make the supporting rope accessible from the outside;
- 5 - hooking the supporting rope by a hooking means;
- extracting the supporting rope by the hooking means from the wound insulated conductors for a predetermined length;
- clamping the extracted length of the supporting
- 10 rope by a mooring means;
- releasing the supporting rope from the hooking means;
- suspending the cable to sustaining structures of the overhead line by the mooring means.